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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/636,161	08/10/2000	SHUMIN WANG	98124X205487	6517

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PHYLLIS T. TURNER-BRIM, ESQ., LAW DEPARTMENT
CABOT MICROELECTRONICS CORPORATION
870 NORTH COMMONS DRIVE
AURORA, IL 60504

EXAMINER	
UMEZ ERONINI, LYNETTE T	

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 03/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/636,161	WANG ET AL.	
	Examiner	Art Unit	
	Lynette T. Umez-Eronini	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12/8/2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9,16-27 and 32-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9,16-27 and 32-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 3, 4, 8, 16, 17, 20, 24-27, and 35 are rejected under 35 U.S.C. 102(e) as being anticipated by Kaufman et al. (US 6,217,416 B1)

The applied reference has a common inventor and assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

As pertaining to claims 1, 3, 5, 8, 16, 17, 22 and 24-27, Kaufman teaches a chemical mechanical polishing slurry that is able to selectively polish a copper of a copper and tantalum or tantalum nitride containing substrate (column 3, line 23-26). The

polishing slurry comprises an abrasive, an oxidizing agent, at least one complexing agent, and at least one organic amino compound (column 3, lines 41-44).

The abrasive is a metal oxide, which is selected from the group including alumina, titania, zirconia, germania, silica, ceria and mixtures thereof (column 9, lines 34-37) and may be incorporated into an aqueous medium of the polishing slurry (column 10, lines 47-51). The aqueous dispersion of metal oxides may be produced utilizing conventional techniques, such as slowly adding the metal oxide abrasive to an appropriate media, for example, deionized water, to form a colloidal dispersion. (column 10, lines 47-55).

Preferred oxidizing agents include hydrogen peroxide (column 5, lines 26-29).

Useful complexing agents include phosphonic acids (column 5, lines 62-66).

Kaufman teaches an optional film forming agent that is capable of facilitating the formation of a passivation layer of metal oxides and dissolution inhibiting layers on the surface of the metal layer, A preferred film forming agent is benzotriazole (column 6, line 27-32 and 38-39).

Kaufman teaches useful inorganic additives that include phosphonic acid, ammonium salts (column 10, line 67- column 11, line 4). The above reads on,

A system for polishing one or more layers of a multi-layer substrate that includes a first metal layer and a second layer comprising:

(i) a liquid carrier);

(ii) at least one oxidizing agent;

(iii) at least one passivation film forming agent;

(iv) at least one polishing additive; and

(v) a polishing pad and/or an abrasive. Since Kaufman uses the same chemical as applicants' polishing additive in combination with the same components of the polishing slurry as claimed in the present invention, then using Kaufman's polishing additive in the same manner as the claimed invention would inherently result in a polishing additive that increases the rate at which the system polishes at least one layer of the substrate, as claimed in the present invention.

Kaufman teaches, the use of an acid or base that contains no metal ions, such as ammonium hydroxide and amines (same as applicant's stopping compound) (column 7, lines 21-25) and additives that include ammonium salts (column 10, line 67 – column 11, line 4, which reads on,

wherein the system further comprises a source of ammonia, **in claim 20**;

wherein the system further comprises at least one stopping compound, **in claim 22**; and

wherein the system further comprises ammonia or an ammonium salt, **in claim 35**.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kaufman (US '416 B1) as applied to claim 1 above, and further in view of Watts et al. (US 5,897,375)

Kaufman differs in failing to teach a nonaqueous solvent.

Watts ('375) teaches, ". . . a new slurry for use in . . . (IC) industry in order to form . . . (CMP) copper interconnects. In particular, the slurry taught herein contains . . . an abrasive slurry . . . and a balance of a solvent such as deionized water or an alcohol (same as applicant's nonaqueous solvent)" (column 2, lines 27-34).

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Kaufman by employing a cmp slurry comprising alcohol as taught by Watts ('375) for the purpose of improving the removal rate of copper (Watts, column 2, lines 38-41).

5. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaufman (US '416 B1) as applied to claim 1 above, and further in view of Hudson (US 5,972,792).

Kaufman differs in failing to teach the abrasive is fixed on the polishing pad, **in claim 5** and no abrasive is present in the system and the polishing pad is a non-abrasive pad, **in claim 6**.

Hudson teaches, "The polishing pad may be a conventional polishing pad made from a non-abrasive material (e.g., polyurethane), or it may be a new generation fixed-abrasive polishing pad made from abrasive particles fixedly dispersed in a suspension medium. The planarization liquid may be a conventional CMP slurry with abrasive

particles and chemicals that remove material from the surface of the wafer, or it may be a solution without abrasive particles . . . " (column 1, lines 16-24).

It is the examiner position that it would have been obvious to one having ordinary skill in the art to modify Kaufman by employing Hudson's conventional polishing pads that contain non-abrasive or abrasive materials along with a CMP slurry that comprises either abrasive or non abrasive particles for the purpose of producing a uniformly planar surface on the semiconductor wafers (column 1, lines 53-54).

6. Claims 9, 18, 19, and 21 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaufman (US '416 B1).

Kaufman discloses a phosphonic acid and organic acids in a polishing slurry. It is noted that Kaufman is silent about a specific phosphonic acid, **in claim 9, 19, and 21** that correspond to those claimed by applicants and an iminodiacetic acid, **in claim 32**.

Phosphonic acids such as those recited in the claimed invention and iminodiacetic acid are used in polishing metal layers.

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Kaufman by using a phosphonic acid including those claimed by applicants' and an iminodiacetic acid for the purpose of obtaining the claimed invention.

7. Claim 23, 33, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kaufman (US '416 B1) as applied to claim 1 above, and further in view of Prigge et al. (US 4,968,381).

Kaufman differs in failing to teach the system comprises at least one polymeric compound that reduces the polishing rate of at least one layer associated with the substrate.

Prigge teaches using a conventional polishing agent in addition to a small quantity of polyvinyl alcohol to produce substantially haze-free semiconductor surfaces as described in British patent specification No. 1,418,088, (DT-OS 2,247,067), (column 1, lines 31-36). Polyvinyl alcohol is an example of a polymeric compound that is described in applicant's Specification (page 11, lines 34ff). Since Prigge's polyvinyl alcohol is used in polishing a semiconductor surface and is the same as applicant's polymeric compound, then using the polyvinyl alcohol in a polishing agent in the same manner as that of the claimed invention would result in a polymeric compound that reduces the polishing rate of at least one layer associated with the substrate.

Hence it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify the combination of Kaufman by using a polymeric compound such as polyvinyl alcohol that is taught by Prigge for the purpose of obtaining a haze-free semiconductor surface (Prigge, column 1, lines 31-36).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 571-272-1470. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ltue

March 8, 2004

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER